

Royal Microscopical Society was of great interest, and gave promise that his forthcoming *Challenger* Report will be of high importance as a contribution to the morphology of these Echinoderms. His exhibition of microscopic preparations of the system of cords which he and his father assert to be of a nervous nature was supplemented by an interesting account by Dr. Carpenter, C.B., of the observations and experiments which had led to the conviction as to their nervous nature, which is gradually being accepted by other investigators.

M. MASCART, Professor at the College of France, will give a discourse at the Royal Institution on Friday evening, May 30, the subject being "Sur les Couleurs."

WE regret to learn of the death of Mr. Henry Baden Pritchard, whose name has been so long connected with the *Photographic News*, and with the photographic world in general.

A STRONG earthquake shock causing some damage was felt last week at Panderma and Erdek in the province of Broussa, Asia Minor. Two slight shocks, unattended by any damage, have occurred at Balikesri in the same province.

AT a meeting of the Governors of North Wales University, held last week at Bangor, Mr. Henry Rudolf Reichel, M.A., Fellow of All Souls College, Oxford, was elected Principal of the College.

THAT the railway should be the means of enriching the flora of a district seems strange. This has, however, been shown to be the case in Arbrå parish, in the province of Helsingland, Sweden. Thus, since the extension of the Great Northern main line into this province in 1878, no less than seven new species of plants have immigrated along the line. They are *Galium mollugo*, *Plantago lanceolata*, *Euphorbia helioscopia*, *Dactylis glomerata*, *Bunias orientalis*, *Avena fatua*, and an American importation, *Rudbeckia hirta* (L.). That these must owe their introduction to the railway is clearly demonstrated by the fact that in spite of the closest scrutiny these plants have never before been found in this district, and that they are even now confined to the railway embankment and its immediate vicinity. The four first-named have, in all probability, only come from the parishes south of Arbrå, but the *Bunias orientalis* and *Avena fatua* have no doubt travelled along the line all the way from the province of Gestril-land, to whose flora they belong. The last-named, *Rudbeckia hirta*, which hails from the eastern part of the United States, seems to follow in the track of the navy in the whole of Northern Sweden. In the summer of 1880 it was seen some ten miles south of Bollnäs station; in 1882 it appeared for the first time at Arbrå, about twenty miles further up the railway line; and last year it had travelled as far as Torps parish, in the province of Medelpad, i.e. a distance in four years of about one degree.

A CORRESPONDENT writes in reference to Prof. McKenny Hughes' article on earthworms, that the worst consequence of the sea going over the walls in the Somerset low grounds is that it kills the worms, thousands of which come to the surface and die in agony, and the farmers are very sensible of the evil done to the land for a long time afterwards.

MESSRS. CROSBY LOCKWOOD AND CO. inform us that they will shortly publish "A Treatise on Earthy and other Minerals and Mining," by D. C. Davies, F.G.S. The work, which is uniform with and forms a companion volume to the same author's "Treatise on Metalliferous Minerals and Mining," will be fully illustrated. The same publishers announce a work on an entirely new subject, viz. "Stone-working Machinery, and the Rapid and Economical Conversion of Stone, with Hints on the Arrangement and Management of Stone-Works," by M. Powis Bale, M.Inst.M.E., A.M.Inst.C.E. Messrs. Crosby

Lockwood and Co. also announce "The Blowpipe in Chemistry, Mineralogy, and Geology," by Lieut.-Col. Ross.

THE additions to the Zoological Society's Gardens during the past week include a Hodgson's Partridge (*Perdix hodgsoniae*), presented by Mr. W. Jamrach; a Bonnet Monkey (*Macacus radiatus*), presented by Mr. A. King; two Japanese Pheasants (*Phasianus versicolor*), two Egyptian Geese (*Chenalopex aegyptiaca*), a White American Crane (*Grus americana*), thirteen Green Lizards (*Lacerta viridis*), purchased; two Common Vipers, presented by Mr. W. H. B. Pain; a Common Partridge (*Perdix cinerea*), presented by Mr. R. Steele; a Banded Ichneumon (*Herpestes fasciatus*), presented by Master Adams; twelve Variegated Sheldrakes (*Tadorna variegata*), four Soft-billed Ducks (*Hymenolemus malacorhynchus*), a Bernicle Goose (*Bernicla leucopsis*), an Argentine Tortoise (*Testudo argentina*), presented by Mr. Wm. Petty.

OUR ASTRONOMICAL COLUMN

A NEW COMET OF SHORT PERIOD.—M. Schulhof of Paris has lately ascertained that the observations of the third comet of 1858 (a very limited number) are closely represented by an elliptical orbit with a period of about six years and a half. The comet in question was discovered by Mr. H. P. Tuttle at the Observatory of Cambridge, Mass., on the evening of May 2; it was observed there until May 12, and likewise at Ann Arbor by the late Prof. Watson from May 9 until June 1. Eight observations in all are available for the calculation of the orbit, and upon these M. Schulhof bases four positions, from which he deduces the following elements:—

Perihelion passage, 1858 May 2^h96719 G.M.T.

Longitude of perihelion	200° 46' 27".1
" ascending node	175° 4' 8".5
Inclination	19° 30' 2".0
Angle of eccentricity	41° 21' 5".2
Mean daily sidereal motion	536".881

From these elements we find—

Eccentricity	0.660676	Perihelion distance	1.1950
Semi-axis major	3.5217	Revolution	6.609 years
" minor	2.6436		

M. Schulhof finds the limits for the mean daily motion 612" and 470" corresponding to periods of 5.80 and 7.55 years.

With such elements the comet must approach very near to the orbit of Jupiter, as is the case with nearly all the comets of the short-period group: and with the most probable period (6.6 years) would come into close proximity to the planet in 1879 and 1880. It unfortunately happens that an endeavour to identify this comet with any one of the imperfectly observed comets of past times, or with missing nebulous objects, has so far been fruitless, and hence much uncertainty remains as to the true length of the revolution, but M. Schulhof has prepared sweeping-ephemerides, of which a part is printed in No. 2590 of the *Astronomische Nachrichten*: it contains the sweeping-line for every fourth degree of the sun's true longitude from 40° to 104°. At the time of discovery in 1858 the comet was a very faint object in the comet-seeker, and continued faint during the month that it was observed. To this circumstance and unfavourable weather is attributed its not having been seen at Washington: it was not observed in Europe. Parabolic elements were computed by Profs. Hall and Watson, but no suspicion of periodicity could have arisen from the results of their calculations beyond what comparatively small inclination and direct motion might have suggested; indeed we believe it is somewhere upon record that Prof. Hall considered the tendency was rather towards a hyperbolic orbit. M. Schulhof's merit in drawing the attention of astronomers to the real nature of the comet's path is so much the greater.

Could reliance be placed upon the period given by the few observations in our possession as the most probable one, a return to perihelion might be expected in October next, but as already remarked such period would have brought the comet into close proximity to the planet Jupiter in 1879-80, and the next perihelion passage might be considerably affected thereby. Further, it is to be remarked that with perihelion passage in the middle

of October there would be little or no chance of recovering the comet.

The comet's heliocentric equatorial-coordinates at perihelion are—

$$\alpha \dots -1^{\text{h}}11^{\text{m}}48^{\text{s}} \quad \delta \dots -0^{\circ}43'05'' \quad \lambda \dots +0^{\circ}00'18''.$$

If we combine these with the sun's coordinates, X, Y, Z, in the *Nautical Almanac*, we readily obtain an idea as to the chances of finding the comet, according to different assumed dates of arrival at perihelion. The most advantageous conditions are presented when this falls about the middle of April. If we assume April 11, the R.A. is found to be 208° , N.P.D. 54° , and the intensity of light 11.05, which is four times greater than on the date of the comet's discovery by Tuttle in 1858. As it was then extremely faint, its rediscovery may be a matter of difficulty. We have already one "Tuttle's comet," of short period, and it may perhaps occur to astronomers that the third of 1858 will be aptly named *Schulhof's comet*.

CHEMICAL NOTES

POTILITZIN has recently (*Ber.*, xvii. 276) made some interesting observations on the hydration and dehydration of cobalt chloride. He shows that, besides the already known hydrate $\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$, there exist two hydrates, $\text{CoCl}_2 \cdot 2\text{H}_2\text{O}$ and $\text{CoCl}_2 \cdot \text{H}_2\text{O}$, the former being rose-red in colour, and the latter dark violet. When the dehydrated salt is heated to about 100° , it parts with water, which is again absorbed on cooling. When an aqueous solution of the ordinary hexhydrated salt is heated, or is mixed with a dehydrating agent, the colour changes from pink to blue or dark violet. Potilitzin shows that this change, which he proves to be due to partial decomposition of the hexhydrated salt, may be brought about without raising temperature by the capillary action of unsized paper or a porous plate of stucco.

TOLLENS has made experiments on the sugar-like substance obtained by the action of alkalis on an aqueous solution of formaldehyde. He oxidises methylic alcohol by air in presence of platinum foil at 54° – 55° , and distils; he then treats the crude distillate with baryta water, and so obtains a yellowish precipitate, which, when freed from barium, yields an amorphous syrup that reduces Fehling's solution, and gives results on analysis approximating to the formula $\text{C}_6\text{H}_{10}\text{O}_5$. This syrup is optically inactive, and does not undergo fermentation; on treatment with sulphuric acid, it gives formic and lactic acids (*Landw. Versuchs-Stat.*, xxix. 355).

KANNONIKOW (*Ber.*, xvii. p. 157, abstracts) attempts to measure the refraction-equivalents of various metals by deducting the refraction-equivalents of salts of these metals with organic acids (determined with aqueous solutions of the salts) from the refraction-equivalents of the acids themselves. So far as his results go, they appear to indicate that the refraction-equivalents vary periodically with variations in the atomic weights of the metals.

MM. NILSON AND PETTERSON have prepared pure beryllium chloride by heating the metal in perfectly dry hydrochloric acid gas, and have determined the density of the vapour of this compound. Beryllium chloride can be volatilised without decomposition in an atmosphere of dry nitrogen or carbon dioxide, provided every trace of air is excluded. The density of the gaseous compound for the temperature-interval 686° – 812° agrees with that calculated from the formula BeCl_2 ($\text{Be}=9.1$). The question as to the value to be assigned to the atomic weight of beryllium, which has been so much discussed of late, appears to be now finally settled in favour of the number deduced by applying the periodic law to the study of the properties of this metal and its compounds (*Ber.* xvii. 987).

CONTINUING the researches of Krämers, Prof. Mendeléeff has shown at a recent meeting of the Russian Chemical Society (*Journal of the Society*, vol. xvi. fasc. 2) that the densities of solutions of salts increase together with the increase of their molecular weights. Thus if we take the series of salts HCl , LiCl , NaCl , KCl , . . . BaCl_2 , SnCl_4 , HgCl_2 , and Fe_2Cl_6 , the molecular weights of which are respectively 36.5, 42.5, 58.5, 74.5, . . . 208, 259, 271, and 325, the densities of their solutions in 100 parts of water, at 15° to 20° , are: 1.010, 1.014, 1.023, 1.025, . . . 1.098, 1.106, 1.128 (calculated), and 1.134. The densities increase as the molecular weights increase; but if we take, instead of the molecular weights, the weights of their

equivalents, or those of the equivalents of metals, the regularity of increase disappears. Prof. Mendeléeff adds that the above is true, not only with regard to chlorides, but also with regard to the salts of bromine and iodine, and many others. Reserving to himself further to pursue his researches in this way, Prof. Mendeléeff points out the following relation:—If the molecular weight of the dissolved body be M , and the solution be represented by $nM + 100 \text{H}_2\text{O}$ (where n represents the number of molecules), the density, D , of the solution may be expressed for many bodies by the following equation:— $\left(\frac{n}{D - D_0}\right)^k = A + Bn$, where D_0 is the density of water, and k is equal to unity, or very near to it. This equation must be considered, however, only as preliminary, ulterior researches promising to give a more general formula. A and B are two constants, which vary with the temperature. Thus, for HCl at 0° (the density of water at 4° being taken = 1), $A = 94.5$ and $B = 1.725$; at 20° , $A = 102.2$, and $B = 1.80$; at 40° , $A = 106.2$, and $B = 1.85$; at 60° , $A = 105.2$, and $B = 2.05$; at 80° , $A = 100.6$, and $B = 2.25$; and at 100° , $A = 94.5$, and $B = 2.55$, the coefficient k being in all cases equal to unity.

ON THE NOMENCLATURE, ORIGIN, AND DISTRIBUTION OF DEEP-SEA DEPOSITS¹

Introduction

THE sea is unquestionably the most powerful dynamic agent on the surface of the globe, and its effects are deeply imprinted on the external crust of our planet; but among the sedimentary deposits which are attributed to its action, and among the effects which it has wrought on the surface features of the earth, the attention of geologists has, till within quite recent times, been principally directed to the phenomena which take place in the immediate vicinity of the land. It is incontestable that the action of the sea along coasts and in shallow water has played the largest part in the formation and accumulation of those marine sediments which, so far as we can observe, form the principal strata of the solid crust of the globe; and it has been from an attentive study of the phenomena which take place along the shores of modern seas that we have been able to reconstruct in some degree the conditions under which the marine deposits of ancient times were laid down.

Attention has been paid only in a very limited degree to deposits of the same order, and, for the greater part, of the same origin, which differ from the sands and gravels of the shores and shallow waters only by a lesser size of the grains, and by the fact that they are laid down at a greater distance from the land and in deeper water. And still less attention has been paid to those true deep-sea deposits which are only known through systematic submarine investigations. One might well ask what deposits are now taking place, or have in past ages taken place, at the bottom of the great oceans at points far removed from land, and in regions where the erosive and transporting action of water has little or no influence. Without denying that the action of the tidal waves can, under certain special conditions, exert an erosive and transporting power at great depths in the ocean, especially on submerged peaks and barriers, it is none the less certain that these are exceptional cases, and that the action of waves is almost exclusively confined to the coasts of emerged land. There are in the Pacific immense stretches of thousands of miles where we do not encounter any land, and in the Atlantic we have similar conditions. What takes place in these vast regions where the waves exercise no mechanical action on any solid object? We are about to answer this question by reference to the facts which an examination of deep-sea sediments has furnished.

A study of the sediments recently collected in the deep sea shows that their nature and mode of formation, as well as their geographical and bathymetrical distribution, permit deductions to be made which have a great and increasing importance from a geological point of view. In making known the composition of these deposits and their distribution, the first outlines of a geological map of the bottom of the ocean will be sketched.

This is not the place to give a detailed history of the various contributions to our knowledge of the terrigenous deposits in deep water near land, or of those true deep-sea deposits far removed from land, which may be said to form the special subject of this communication. From the time of the first expeditions under-

¹ A Paper read before the Royal Society of Edinburgh by John Murray and A. Renard. Communicated by John Murray